REFERENCES

Atkinson, David, *et al*, "Japanese Bank Asset Quality: Banks," Goldman Sachs Global Equity Research, October 31, 2001.

Jerram, Richard, "Profits Slip in 1Q03," ING Financial Markets Economic News, June 5, 2003.

Kim, Se-Jik, "Macro-Effects of Corporate Restructuring in Japan," Japan 2003 Selected Issues, 2003.

Matsuoka, Mikihiro, "MoF Corporate Survey: 1Q 2003," Deutsche Bank Group Equity Research, Japan, June 5, 2003.

Ministry of Finance Japan, "Financial Statements Statistics of Corporations by Industry," Annual.

Worldscope Database, Thomson Financial, 2002.

II. Macro-Effects of Corporate Restructuring in Japan[1]

A. Introduction

1. **This chapter quantitatively evaluates the effect of corporate restructuring in Japan, particularly whether its long-run benefit can be large enough to outweigh its short-run costs**. Using firm-level financial statement data, it estimates total factor productivity (TFP) of individual Japanese firms. Given the estimated cross-firm distribution of productivity, it simulates the effect of an optimal restructuring—reallocation of resources from less-productive firms to more-productive ones—on the dynamic path of aggregate output. The results, while only illustrative, suggest that the benefit of restructuring could substantially exceed the cost.

2. **Having suffered stagnation for more than a decade since the bursting of an asset bubble**, a broad consensus has emerged in Japan that the economy's malaise at least partly reflects deep-seated structural problems in the corporate and financial sectors (e.g., Peek and Rosengren, 2003; Hamao, Mei, and Xu, 2003; Dell'Ariccia, 2003). In fact, the recognition of serious structural weaknesses prompted the Koizumi cabinet to vow to press strongly ahead with structural reform. However, there is still an ongoing debate on the optimal pace of reform.

3. **Differences of views on the appropriate pace of reform could be attributed at least partly to insufficient information on the consequence of restructuring**. With large uncertainty about the end-result, policymakers can easily become hesitant or reluctant to push hard for reforms and public support for reform can easily wane. This underlines the importance of knowledge on the costs and benefits of corporate restructuring.

4. **There are some studies estimating the effects of restructuring in Japan** (e.g., Atkinson, Ishida, Ishii, and Tanaka, 2001; Young, Fujii, Murashima, and Packer, 2002; Cabinet Office, 2001). Most of these, however, focus on the short-run costs, particularly the adverse short-run effect on employment. For example, Atkinson *et al* (2001) examine the impact on the economy of eliminating potential problem loans (which they estimated at ¥237 trillion as of FY2000). By assuming a 50 percent loss of employment for companies that they consider to be "effectively bankrupt," 20 percent for companies with "bankruptcy risk," and 10 percent for the "watch list," they obtain an estimate of gross number of job losses. Assuming that 43 percent of the job losers get new jobs, the study concludes that restructuring could generate 2 million unemployed, representing a 3.2 percentage point rise in the unemployment rate. Young *et al* (2002) study the disposal of ¥40 trillion of nonperforming loans. Based on the assumptions that the ratio of employment to corporate liabilities is constant and that 60 percent of the firms with bad loans are liquidated, they suggest that restructuring would increase the jobless rate by 2 percentage points.

5. **This chapter conducts a quantitative assessment of both costs and benefits of restructuring in Japan**. A key idea is that corporate restructuring can raise aggregate output

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[1] Prepared by Se-Jik Kim (RES, ext. 39030).

by raising the average productivity of the corporate sector, as a result of the reallocation of resources from *less-productive* firms to *more-productive* firms (see Kim, 2002; Kim and Izvorski, 2002).

6. **Based on this idea, the chapter presents a simple empirical framework to quantitatively evaluate the dynamic output gain from restructuring**. Using Cobb-Douglas production functions, together with firm-level financial statement data, it derives the total factor productivity of individual firms and the distribution of productivity across those firms. The productivities of individual firms are then used to simulate the effect of an optimal restructuring on aggregate output.

7. **The framework also incorporates the cost of restructuring**. Restructuring entails loss of firm- or industry-specific capital and skills when resources are redeployed to other firms. Based on the result of previous studies on this subject, I assume that the value of capital, after restructuring, drops by 72 percent, and that laid-off workers permanently lose their earning abilities by 30 percent (see, e.g., Ramey and Shapiro, 2001). Costs also arise because output is lost during the time it takes to reallocate resources. A year typically passes between the time a firm decides to cease operation and the time it sells its capital and a large portion of laid-off workers remain unemployed for at least a year (OECD, 2002; Ramey and Shapiro, 2001). The framework incorporating both the benefits and the costs of reallocation, together with plausible values for key parameters, allows us to trace the dynamic response of aggregate output to a shock of restructuring.

8. **From the simulation based on financial statement data of 1,555 Japanese firms from *Worldscope* database, the chapter derives the following results**. First, in the very short run restructuring could reduce the country's aggregate output below its initial level. In a benchmark case, the reallocation of resources from the least-productive firms representing bottom 5 percent of total labor reduces aggregate output by 0.8 percent below the initial level in the year of restructuring, largely reflecting the short-run output loss due to the closure of the least-productive firms. Second, in the medium term aggregate output surpasses its initial level in response to restructuring. In the benchmark case, aggregate output exceeds its initial level starting from the third year after restructuring, and converges to a level 1.6 percent above its initial level. Finally, the medium-term output gain from restructuring in Japan could substantially outweigh the short-term output loss, as the larger medium-term gain reflects a large productivity gap between less-productive firms and more-productive firms.

B. Productivity Distribution

Estimation Method and Data

9. **To estimate the distribution of productivity across corporations**, I use standard Cobb-Douglas production functions, which have been widely used in the economic growth literature to measure the rate of technology progress (e.g., Slow, 1957). There is also evidence that Cobb-Douglas production function fits well in Japan (Kamada and Masuda, 2001). Assume that the production technology of each firm is represented by:

$$y_i = A_i\, l_i^{(1-\alpha)}\, k_i^{\alpha} \tag{1}$$

where y_i is output, A_i total factor productivity, l_i labor, k_i capital, α capital income share of the i-th firm, respectively. Then a firm's total factor productivity is:

$$A_i = \frac{y_i}{l_i^{(1-\alpha)} k_i^{\alpha}} \tag{2}$$

10. **To estimate total factor productivity at the firm level,** I use *Worldscope* financial statement data of Japanese firms for the period 2000–2002. *Worldscope* originally provides data for 3,918 Japanese firms, but the number of firms that have the information amounts to 1,555 (representing around 20 percent of total corporate liabilities in the economy).

- *Worldscope* data does not provide information that exactly matches the concept of output. As a proxy for output of individual firms, y_i, I use *gross income*, which is the difference between total sales and the cost of goods sold. Existing studies often use *total sales* as a proxy for output (e.g., Khatri, Leruth, and Piesse, 2002). Nevertheless, gross income approximates "value-added" better than does total sales. Regarding labor input, I use the number *of employees*. Regarding physical capital, I use *fixed assets*. Some existing studies use *total assets* (e.g., Khatri, Leruth, and Piesse, 2002), but fixed assets are conceptually closer to physical capital such as machinery, plant and equipment. *Worldscope* does not provide information on capital and labor income share of individual firms. I use the labor income share of the industry to which a company belongs as a proxy for that of the firm. Based on 2002 data reported by the Department of Statistics of the Ministry of Finance, I assign 0.78 to the parameter of labor income share for manufacturing, 0.77 for retail and wholesale trade, 0.76 for services, 0.85 for construction, 0.53 for mining, 0.39 for real estate, and 0.85 for agriculture.

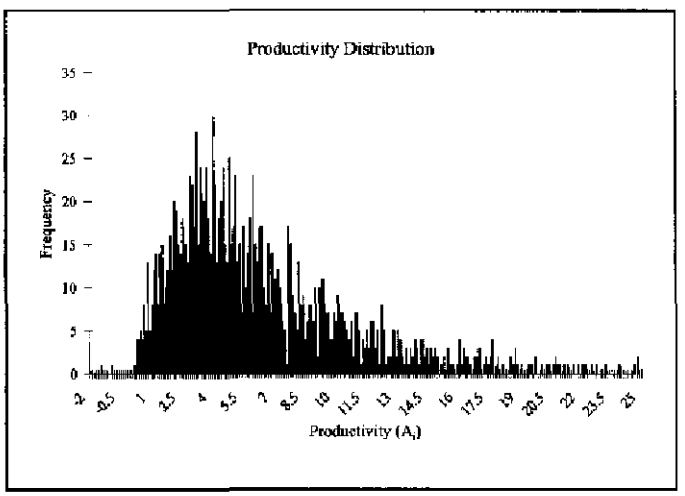
- Using Eq. (2) and the yearly data on y_i, l_i, k_i, and α, I calculate the total factor productivity of each firm for each of the three years, 2000, 2001, and 2002. To reduce potential measurement errors generated by year-specific idiosyncratic shocks, I use a three-year-average productivity of each firm, i.e., $A_i = \frac{\sum_{s=2000}^{2002} A_{i,s}}{3}$, where $A_{i,s}$ represents productivity of the i-th firm.[2]

[2] There is a strong persistence in productivity of each individual Japanese firm over time. According to the data, for example, the three-year-average productivity for 1993–1995 is a good predictor of the three-year-average productivity for 2000–2002.

Productivity Distribution

11. **The figure illustrates the estimated productivity distribution among the 1,555 firms.**[3] It suggests that there is a large dispersion in productivity across the 1,555 firms. While the average productivity $\left(\mu(A_i) = \frac{\sum_{i=1}^{N} A_i}{N} \right)$ is 6.9, the standard deviation is 8.5.

- In the rest of the chapter, we interpret the result in this figure as representing the distribution of productivity for the Japanese corporate sector as a whole. Of course, *Worldscope* covers most large firms but not many small and medium-sized firms, which could generate a bias. Inclusion of data on more SMEs, however, would not make even larger the positive net effect of restructuring given that SMEs in Japan are considered to be less productive than larger firms.



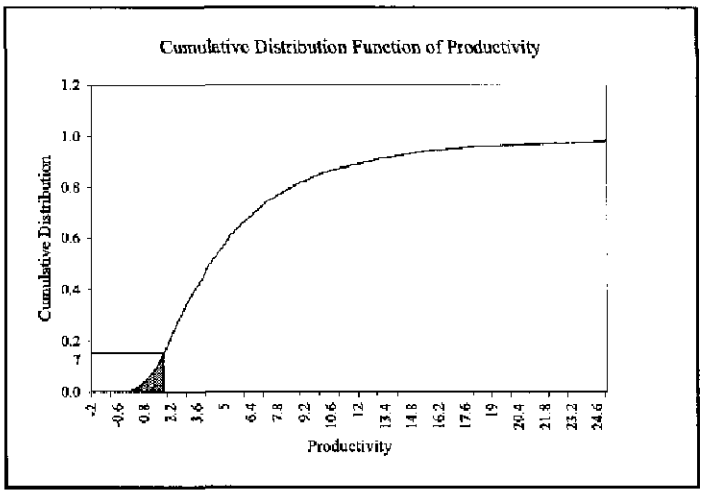
C. Simulation—Benchmark Case

Basic simulation framework

12. **To simulate the effect of restructuring on aggregate output,** I consider the case of restructuring the least-productive firms that represent fraction γ of total number of workers, that is, those with the lowest values of A_i, starting with the least productive and adding firms until those representing γ percent of total workers are cumulated. Based on the calculation of

[3] Given that *Worldscope* provides information on the proxies for output and capital in a monetary unit (more specifically, million yen) and for labor in persons, the unit of $A_{i,s}$ is (million yen / man)$^{(1-\alpha)}$. However, the unit of $A_{i,s}$ could be interpreted also as a pure number if we represent labor in a monetary unit. For example, the unit of productivity reported here can be interpreted as a pure number that would be obtained if we assume that a unit of labor is equivalent to million yen. Of course, there can be other ways to convert the unit of labor into a monetary unit, including the multiplying of labor by per-worker wages. It can be shown, however, that the modification would not substantially alter the effect of restructuring on aggregate output (see Sensitivity to Proxies).

productivity of individual firms, we can identify the least-productive firms representing fraction γ of total number of workers, as illustrated in this figure.



13. **Assume that restructuring occurs in the beginning of the year** t =1. Therefore the least-productive firms cannot produce from the first year of restructuring (t = 1) on. Let i^B and i^G denote the set of the least-productive firms and the rest of the firms (i.e., more-productive firms), respectively.

14. **Restructuring reduces the amount of capital and labor employed by the least-productive firms**. Let K_t^B and L_t^B be the total amount of capital and labor of those firms at t, respectively. Then capital and labor employment by those firms is positive before restructuring (K_0^B, $L_0^B > 0$), but zero after restructuring ($K_t^B = L_t^B = 0$ for $t = 1, 2, \ldots$).

15. **Restructuring raises capital and labor employed by more-productive firms**. After restructuring, the amount of capital used by each more-productive firm ($i \in i^G$) increases as:

$$k_t^i = k_0^i + \delta_t^{k,i} \tag{3}$$

where k_t^i is the amount of capital of a more-productive firm at year t, k_0^i is the amount of capital of the firm before restructuring ($t = 0$), and $\delta_t^{k,i}$ is the amount of capital reallocated from the least-productive firms to the firm through year t.

16. **Similarly, restructuring raises labor employed by more-productive firms by**:

$$l_t^i = l_0^i + \delta_t^{l,i} \tag{4}$$

where l_t^i is the amount of labor of the firm with higher productivity at year t and $\delta_t^{l,i}$ is the amount of labor reallocated from the least-productive firms to the firm through year t.

- Assume that capital and labor of the least-productive firms ($K_0^B$and L_0^B) are reallocated to more-productive firms, whose measure is (1- γ), in proportion to their initial amount of capital and labor. Therefore, $\delta_t^{k,i}$ and $\delta_t^{l,i}$ are proportional to k_0^i / K_0^G and l_0^i / L_0^G, respectively, where K_0^G and L_0^G are total amount of capital and labor employed by more-productive firms in the initial period $t = 0$, respectively.

- The increase in capital and labor of more-productive firms ($\delta_t^{k,i}$ and $\delta_t^{l,i}$) also critically depends on the restructuring cost. As discussed earlier, restructuring entails a permanent reduction in the value of capital and labor, caused by the loss of firm—or

industry-specific capital and skills. Let θ_k and θ_l denote the discount in the value of capital and labor after reallocation as fractions of their original values, respectively. Restructuring may also keep some laid-off workers out of jobs permanently. Let ψ_l be the portion of laid-off workers that become permanently unemployed. In the presence of such costs, restructuring can raise capital and labor employed by more-productive firms by $K_0^B(1-\theta_k)$ and $L_0^B(1-\theta_l)(1-\psi_l)$, respectively.

17. **Restructuring also creates other costs because capital and labor cannot be reallocated to another firm immediately after its closure**, particularly when aggregate demand is weak. Let ω_k and ω_l denote the portion of capital and labor that is reemployed within the first year of restructuring ($t = 1$). I assume that fraction ω_k of capital and fraction ω_l of labor are reemployed evenly from the beginning to the end of the year, so that more-productive firms use fraction $\frac{\omega_k}{2}$ of capital and fraction $\frac{\omega_l}{2}$ of labor on average in the year of the restructuring. From the second year on, the fraction ω_k of capital and the fraction ω_l of labor that were reemployed in the first year will be fully used for production through the whole year.

- Let $\acute{\omega}_k$ and $\acute{\omega}_l$ be the fraction of the remaining capital and labor that is reemployed in each year ($t = 2, 3, \ldots$). Similar to the case of capital and labor reemployed in the first year, I assume that fraction $\frac{\acute{\omega}_k}{2}$ of capital and fraction $\frac{\acute{\omega}_l}{2}$ of labor, on average, are used in the year when they are reemployed, while the fraction $\acute{\omega}_k$ of capital and the fraction $\acute{\omega}_l$ of labor are fully used from the second year of their reemployment.

- Then the amount of capital reallocated from the least-productive firms to a more-productive firm at t is:

$$\delta_t^{k,l} = \begin{cases} \left(\frac{k_0^{\,i}}{K_0^{\,G}}\right) K_0^{\,B}(1-\theta_k)\left(\frac{\omega_k}{2}\right) & \text{for t=1} \\ \left(\frac{k_0^{\,i}}{K_0^{\,G}}\right) K_0^{\,B}(1-\theta_k)\left[\omega_k + (1-\omega_k)\left(\frac{\acute{\omega}_k}{2}\right)\right] & \text{for t=2} \\ \left(\frac{k_0^{\,i}}{K_0^{\,G}}\right) K_0^{\,B}(1-\theta_k)\left[\omega_k + (1-\omega_k)\acute{\omega}_k \sum_{s=0}^{t-3}(1-\acute{\omega}_k)^s + (1-\omega_k)(1-\acute{\omega}_k)^{t-2}\left(\frac{\acute{\omega}_k}{2}\right)\right] & \text{for t=3,4...} \end{cases} \quad (5)$$

and the amount of labor reallocated to a more-productive firm at t is[4]

$$\delta_t^{I,i} = \begin{cases} \left(\frac{l_0^i}{L_0^G}\right) L_0^B (1-\theta_l)(1-\psi_l)\left(\frac{\omega_l}{2}\right) & \text{for t=1} \\ \left(\frac{l_0^i}{L_0^G}\right) L_0^B (1-\theta_l)(1-\psi_l)\left[\omega_l + (1-\omega_l)\left(\frac{\acute{\omega}_l}{2}\right)\right] & \text{for t=2} \\ \left(\frac{l_0^i}{L_0^G}\right) L_0^B (1-\theta_l)(1-\psi_l)\left[\omega_l + (1-\omega_l)\acute{\omega}_l \sum_{s=0}^{t-3}(1-\acute{\omega}_l)^s + (1-\omega_l)(1-\acute{\omega}_l)^{t-2}\left(\frac{\acute{\omega}_l}{2}\right)\right] & \text{for t=3,4...} \end{cases} \quad (6)$$

- Using the dynamic path of capital and labor employed by more-productive firms (Eqs. (3)–(6)), together with their productivity derived earlier, I derive the dynamic path of output for each of those firms from the production function: $y_{i,t} = A_i \; l_{i,t}^{\;1-\alpha} k_{i,t}^{\;\alpha}$.

- Given that the least-productive firms produce nothing after restructuring ($Y_t^B = 0$, for $t = 1,2,\ldots$), aggregate output of the economy is given by

$$Y_t = Y_t^G = \sum_{i \in I^G} y_{i,t} \quad (7)$$

Benchmark case

18. **To quantify the effect of restructuring on aggregate output, I assign plausible but rather conservative values to each of the key parameters of the basic framework.** Therefore, for these illustrative calculations, the estimate obtained in this benchmark case can be viewed as a lower bound on the level of aggregate output after restructuring.

- For the discount of capital due to redeployment, I choose $\theta_k = 0.72$, so that capital loses 72 percent of its value after reallocation, following the estimate suggested by Ramey and Shapiro (2001). Ramey and Shapiro obtain this estimate using the equipment-level data from US aerospace plants that closed during the 1990s, and suggest that given the low demand for aerospace equipments, their estimate could be an upper bound on the discount. In light of this, adopting their estimate is a conservative assumption. For the parameter of loss in labor skills of a laid-off worker, I choose $\theta_l = 0.3$, so that displaced workers lose 30 percent of their skills. The chosen value is also conservative; Ruhm (1991) obtains 0.13 for the parameter based on US household panel data for 1962–1982. The longer tenure of average Japanese workers could imply higher firm-specific human capital and therefore larger skill losses in the

[4] Such dynamic adjustment paths of capital and labor can be derived from a convex adjustment cost function. In the case of Japan, Ogawa (2003) derives and estimates a dynamic path of labor based on quadratic adjustment cost of hiring/firing.

event of labor reallocation. I also make another conservative assumption that $\psi_l = .25$, indicating that 25 percent of laid-off workers cannot get a new job again.

- For the rate of the first-year reallocation of capital and labor, I choose $\omega_k = 0$ and $\omega_l = 0$, indicating that factors of production are not redeployed within a year. In addition, the reallocation rates of capital and labor in the second year and consecutive years (t=2, 3, ...) are assumed to be $\dot{\omega}_k = \dot{\omega}_l = \frac{1}{2}$.

- The assumption that no laid-off workers are reemployed and no capital is bought by other firms for a year after restructuring is also conservative. It implies that during the first year of restructuring there would be no demand for workers and capital released from closed firms. One may expect *weak* demand for labor and capital in Japan, which currently suffers from prolonged stagnation, continuing excess capacity and weak aggregate demand. Nevertheless, assuming *no* demand is rather extreme. Indeed, high-productivity firms in Japan actively hire new workers, invest in capital, and therefore absorb a large percentage of laid-off workers and capital, even in a time of very weak aggregate demand.[5] The data on 1,555 firms in our sample shows that the 200 most-productive firms have raised their employment and fixed assets by 35 percent and 16 percent, respectively, during the period 2000–2002. This suggests that reallocation of resources to more-productive firms could proceed faster than assumed here.

- For the size of the restructuring shock in the benchmark case, I choose $\gamma = 0.05$. That is, I consider the case of restructuring the least-productive firms that represent 5 percent of total workers. These firms also represent 5 percent of total debt outstanding and 5.5 percent of total capital.[6] However, these firms produce only 0.8 percent of the aggregate output, reflecting their low productivity.

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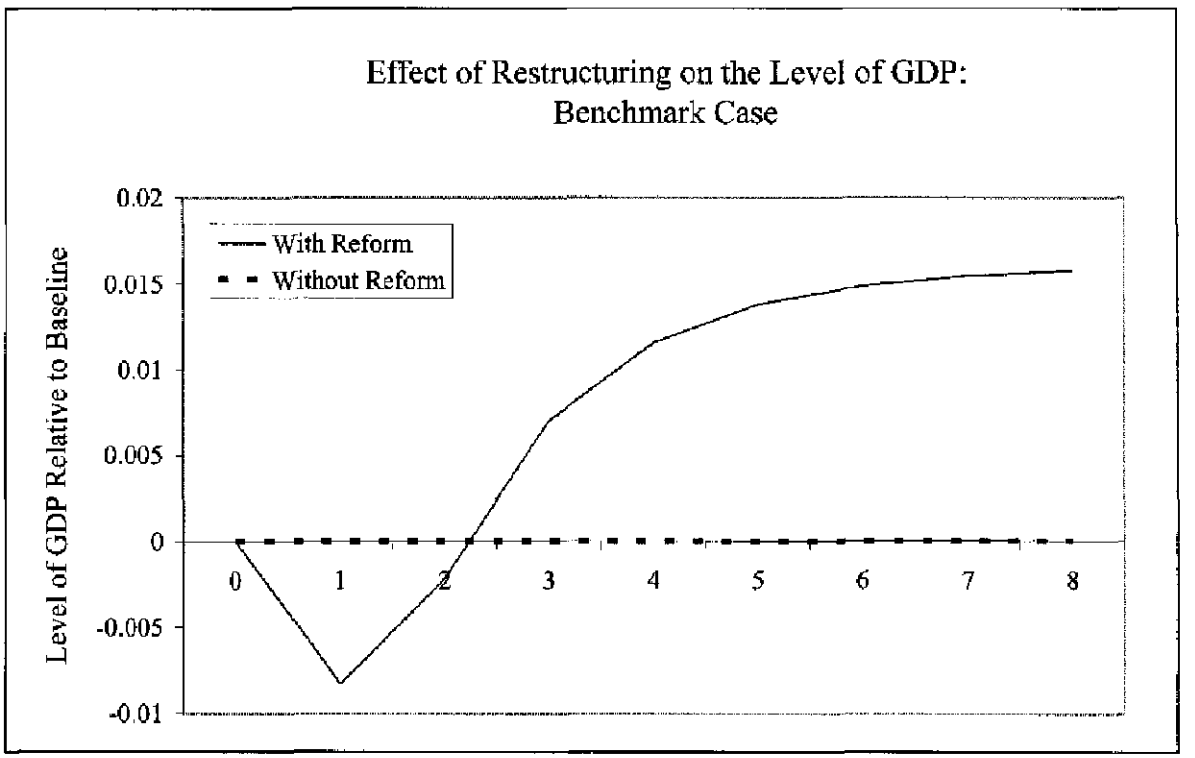
[5] The analysis of this chapter is focused on the supply (production) side, while demand condition is implicitly represented by the assumptions on some parameters. In particular, we can interpret the assumptions on the parameter values for reemployment rates of capital and labor as reflecting aggregate demand conditions. For example, the benchmark assumptions ($\omega_k = 0$ and $\omega_l = 0$) could be interpreted as representing a pessimistic assumption on aggregate demand during one year after restructuring. The analysis of sensitivity against different parameters (Section D) also can be interpreted as showing to what extent the main result is affected by different assumptions on aggregate demand.

[6] In the benchmark case, I choose $\gamma = 0.05$ because restructuring of 5 percent of the corporate sector could generate a substantial output effect while perhaps still within a feasible range.

Results

19. **This figure shows the simulation result in the benchmark case.** To simplify the exposition, I here normalize the initial level of aggregate output at unity ($Y_0 = 1$). In a baseline scenario without restructuring, aggregate output would then remain constant at the initial level $Y_t = 1$ for $t = 1, 2, \ldots$.

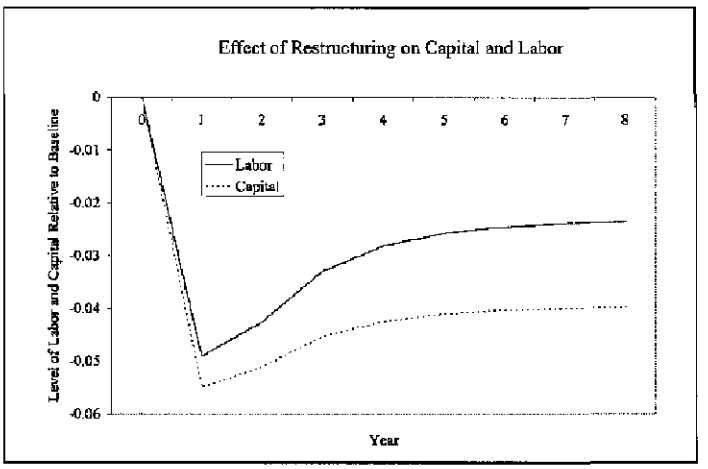


With restructuring, however, output deviates from the baseline, as shown above.

20. **The simulation provides interesting results on both short-term and medium-term effects of restructuring.** In the benchmark case, aggregate output in the first year of restructuring falls to $Y_1 = 0.992$, while in the second year, the level of the aggregate output rises compared to that of the first year, but still is 0.2 percent below the baseline. The negative short-run effect largely reflects the output decline due to the closing of the least-productive firms. From the third year on, however, aggregate output exceeds its baseline level. The positive medium-term effect reflects that the increase in output of more-productive firms outweighs the output loss from the closure of the least-productive firms as the former reemploys labor and capital released from the latter. Finally and most importantly, the medium-term output gain from restructuring exceeds the output loss in the first and second year. Aggregate output converges to a level 1.6 percent above the baseline, double its initial decline. As a result, there is a large net gain evaluated in terms of present discounted value

under any reasonable rate of discount.[7] The larger medium-term gain reflects a large productivity gap between the least-productive firms and more-productive firms.

21. **The short-term output loss is modest despite a substantial drop in capital and labor employed**. Particularly in the first year of restructuring, aggregate use of labor and capital drop by 5 percent and 5.5 percent, respectively. From the second year, more-productive firms employ an increasing amount of resources released from less-productive firms, but new steady state levels of aggregate labor and capital remain below their initial levels, reflecting a substantial loss of firm- or industry-specific capital and skills, together with some permanent unemployment.



D. Sensitivity Analysis

22. **This section tests the sensitivity of the results obtained in the previous section.** It first checks the robustness of the results against different proxy variables for output, capital and labor, and then test the sensitivity to the choice of key parameters of the model.

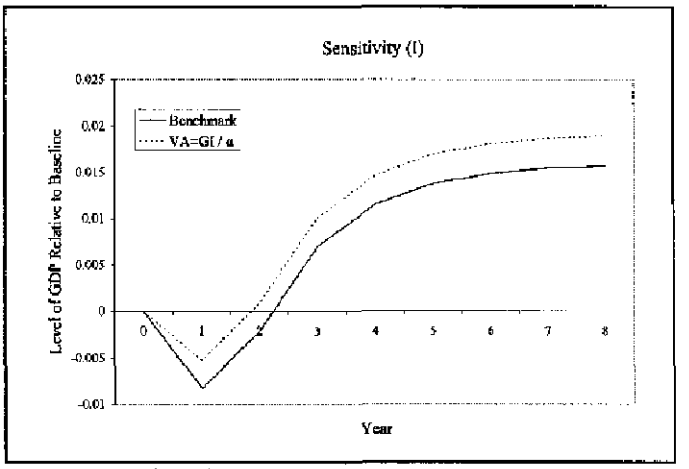
Sensitivity to Proxies

23. **To check the sensitivity to the choice of proxies for key variables such as output, capital and labor**, I use different proxy variables. First, I use *(gross income)/capital income share* as another proxy for output. This variable could be a better proxy if most of labor costs are included in the cost of goods sold (rather than other operating expenses) in the financial statement data. The rational for using this proxy is that in this case, under the assumption of a Cobb-Douglas production function, we have y = *gross income* / α, where y is output or value-added and α is the capital income share.[8]

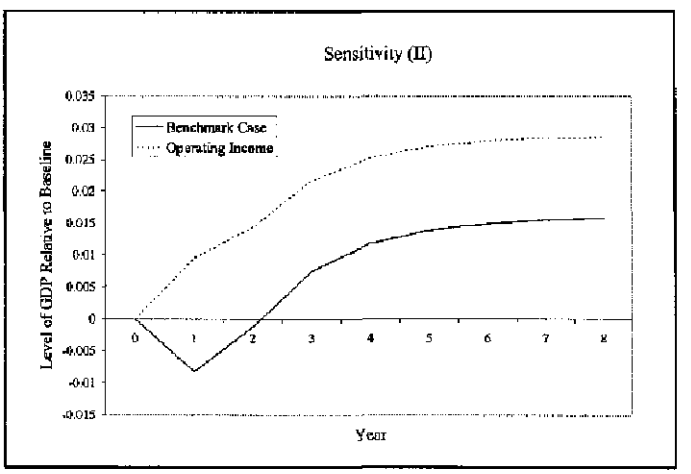
[7] Under 5 percent discount rate, for example, the net present value of output gains for 20 years amounts to 15 percent of the initial output. In addition, as long as the rate of discount is below 65 percent, the net present value of output gain is always positive.

[8] It is derived from *gross income* = $y - w = y - (1-\alpha) y = \alpha y$, where w is wage cost.

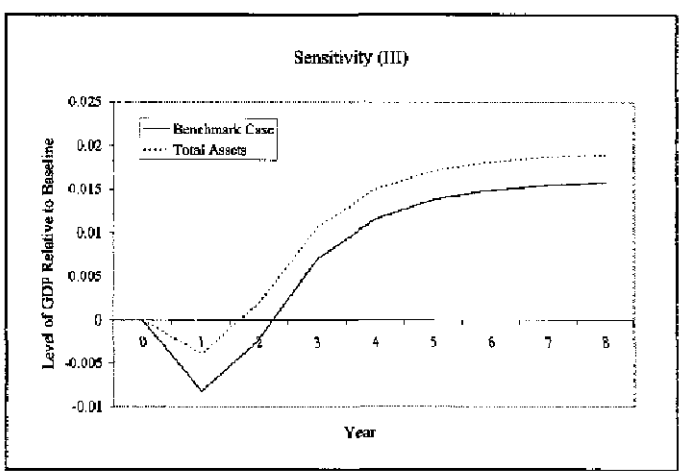
- This figure illustrates the effect of restructuring on aggregate output when *(gross income)/capital income share* is used as a proxy for output. The dynamic path of the aggregate output in this case is similar to that in the benchmark case, with a slight increase in the output gain from restructuring. Aggregate output declines to 0.5 percent below its initial level in the first year, and it converges to a level 1.9 percent above its initial level.



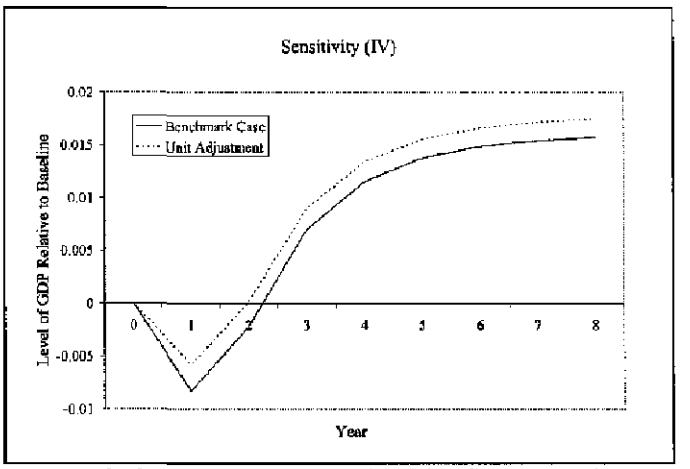
- I also use *operating income* as a third proxy for output. The figure shows that the positive effect of restructuring in this case is substantially larger than the benchmark case. Aggregate output rises to the level 1.0 percent above its initial level even in the first year, and converges to a level 2.9 percent above its initial level. The reason for the large effect is that about 8 percent of the firms in the data had negative operating profits on average for 2000–2002. Therefore, just closing those firms with negative operating income would substantially raise aggregate output, even without reallocating released resources to more-productive firms.



- As another proxy for capital, I use *total assets* instead of fixed assets. As illustrated in the figure, the effect of restructuring on the aggregate output in this case is also similar to that in the benchmark case, with a slightly larger gain.

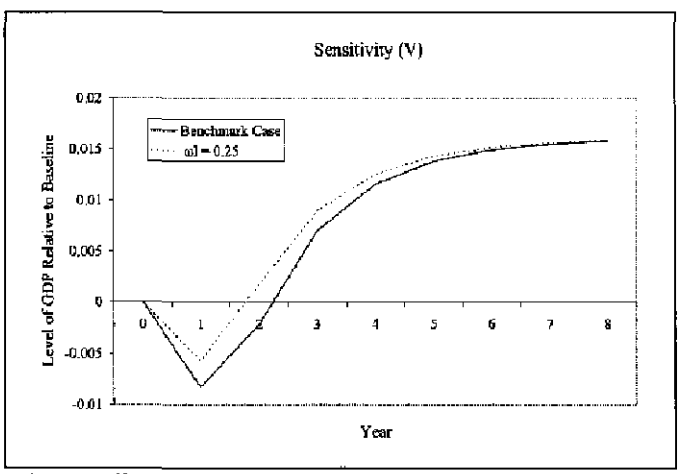


- I also use *the number of employees multiplied by per employee wage* as a proxy variable for labor input. In this case, labor input is measured by a monetary unit, and therefore the unit of TFP becomes a pure number. The figure shows that the dynamic path of aggregate output in this case is also similar to that in the benchmark case. The restructuring reduces aggregate output to the level 0.6 percent below its initial level in the first year, but raises it thereafter to a level 1.8 percent above its initial level.

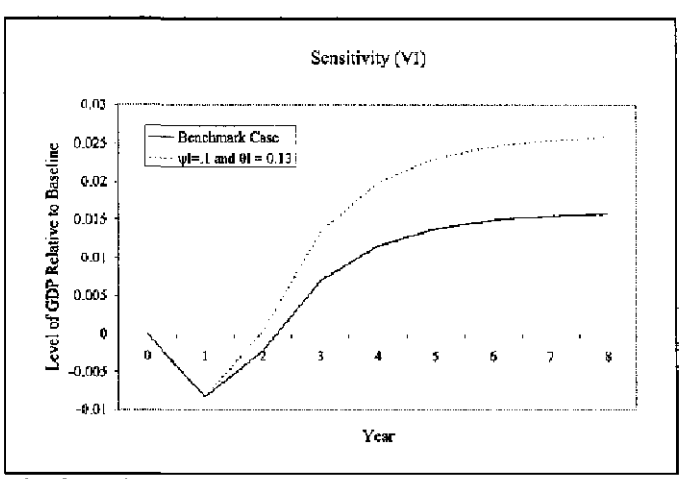


Sensitivity to Parameters

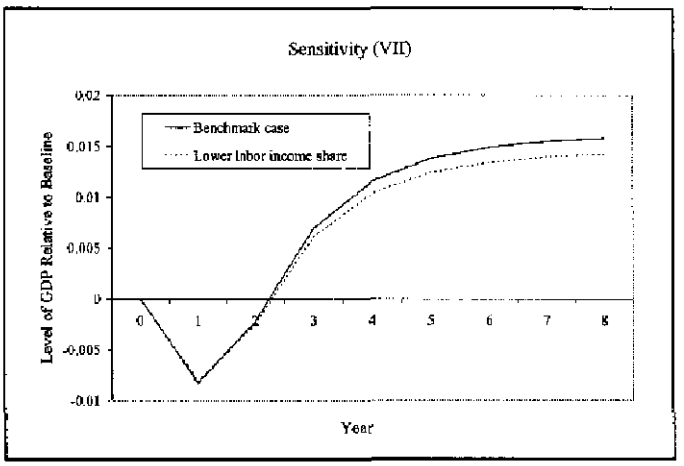
24. **I assess the sensitivity of our results to changes in key parameter values.** First, I use $\omega_l = 0.25$ for the rate of labor reemployment in the first year, instead of $\omega_l = 0$ in the benchmark case. The assumption $\omega_l = 0$ can be considered a conservative assumption. In Korea, for example, 40 percent of newly unemployed workers found new jobs within a year at the peak of the recent financial crisis. The figure shows that under a less conservative assumption ($\omega_l = 0.25$), the medium-term output gain from restructuring is unaltered, while the initial output loss shrinks slightly (from 0.8 percent to 0.6 percent). Therefore, the accumulated net output gain has only a marginal change.



25. **Next, I simulate less conservative assumptions on the loss of labor for the parameter representing loss of laid-off workers' skills**, I use $\theta_l = 0.13$ (instead of $\theta_l = 0.3$ in the benchmark case) based on Ruhm (1991)'s estimate. For the ratio of permanent unemployment among laid-off workers, I use 0.1 instead of the benchmark case' 0.25. The figure shows that when using these two new parameter values, the medium-term output gain is substantially larger than in the benchmark case.



26. **Finally, I check the sensitivity of the results to the choice of labor income share parameters**. The estimates of labor income shares used in the benchmark case are calculated based on data for 2002 when the rate of interest was close to zero, and therefore the estimates may be systematically biased upward. To check the robustness, I assume that labor income shares of all industries are over-estimated by 20 percent. The result shows that the aggregate output path in this case is similar to that in the benchmark case.



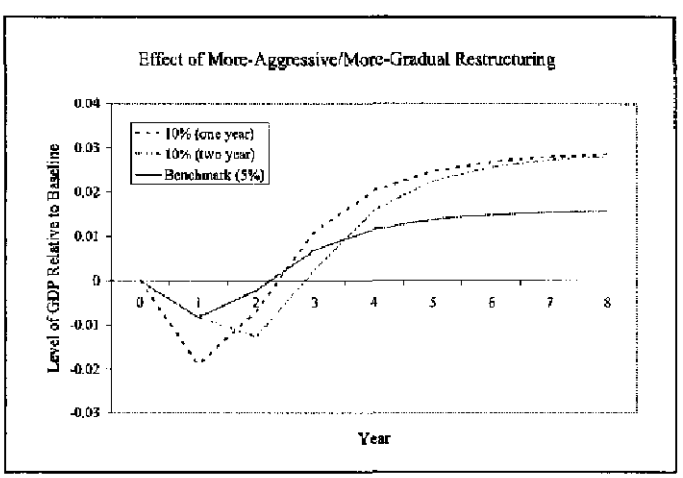
27. **In sum, the above sensitivity analysis suggests that the main result of this chapter**—that the medium-term gain of restructuring exceeds the short-run cost—is robust against various changes in proxies and key parameters. The size of the effect of restructuring is altered only marginally in a vast majority of cases. Furthermore, different choices of parameters and proxies are more likely to raise the net gain from restructuring because the chapter starts with conservative assumptions.

E. Further Discussions

28. **This section explores how the path of output is affected by the pace of restructuring**, and by assuming that restructuring involves resource reallocation only within industries. It also discusses obstacles to efficient restructuring, how macro-effects of restructuring can be affected by inaccurate identification of the least productive firms, and the output effects of bank-led restructuring through NPL disposal.

Scale and Pace of Reform

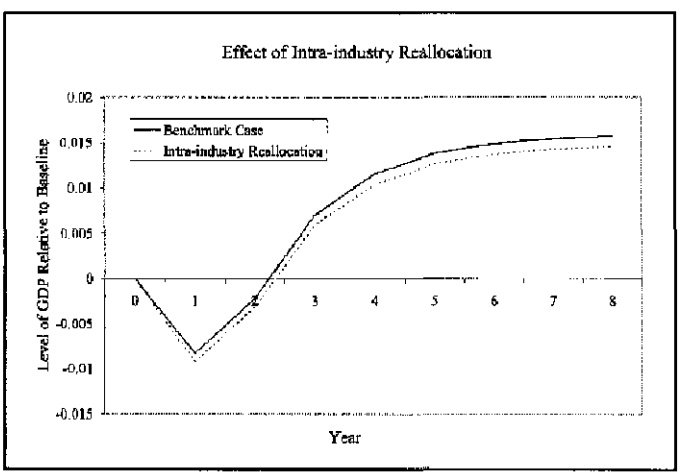
29. **First, consider the effect of more-aggressive restructuring**. The figure shows the effect of restructuring the least-productive firms representing 10 percent of labor ($\gamma = 0.1$) in the beginning of the year t=1 (instead of 5 percent in the benchmark case). In this case, aggregate output falls by 1.9 percent in the first year, but eventually converges to a level 2.9 percent above its initial level. This suggests that more-aggressive restructuring would amplify both short-term output losses and medium-term output gains, resulting larger net gains. The figure also



illustrates the effect of more-gradual restructuring. For this experiment, I assume that restructuring of bottom 10 percent firms is carried out over two years: restructuring of the least productive 5 percent firms in a year and the least productive-5 percent-to10 percent firms in the next year. In this case, aggregate output declines to 0.8 percent below its initial level (the same as in the benchmark case of swiftly restructuring the least productive 5 percent firms), but converges to a level 2.9 percent above its initial level (as in the case of swift restructuring of the least productive10 percent firms). Furthermore, the results show that more gradual restructuring spreads out short-run output losses but also delays the pick up in aggregate output.

Intra-industry Resource Reallocation

30. **It is also useful to examine the effect of restructuring a fraction γ of firms in each industry under the assumption that resources released from those firms are reallocated only to other firms in the same industry.** For this exercise, I assume that for each industry the least-productive firms representing 5 percent of the industry's labor are restructured. Note that if we add up the restructured firms across industries in this case, total restructured firms represent 5 percent of the economy's labor, the same as in the benchmark case ($\gamma = 0.05$). The figure shows that the dynamic path of aggregate output is very similar to that of the benchmark case. In this case, aggregate output drops to a level 0.9 percent below its initial level in the first year, while it converges to a level 1.5 percent above its initial level. Therefore, restructuring in this case generates a short-run output loss and medium-term output gains that are almost the same as in the benchmark case.



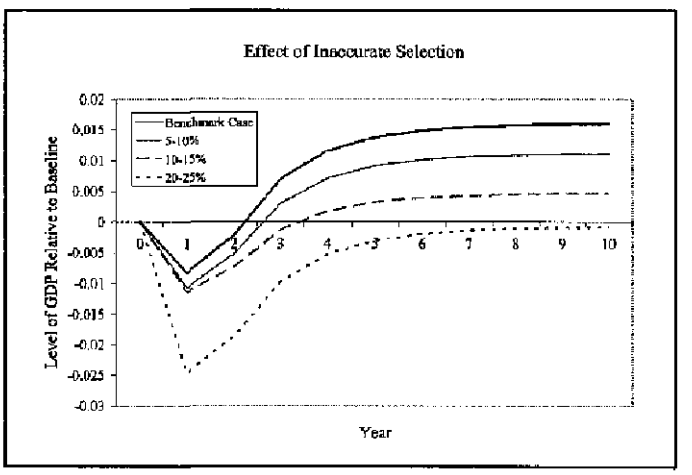
- This indicates that distributions of productivity within industries may be similar to the distribution across industries. Indeed, *Worldscope* data shows a large dispersion in productivity within each of major industries in Japan such as manufacturing, construction, and services as in the economy as a whole.[9]

[9] Note that the loss of firm- or industry-specific capital and skills in the case of intra-industry resource reallocation could be much lower than in the case of inter-industry reallocation. Therefore, if this is taken into account, the net output gain could be even larger. For example, suppose that the rate of reemployment-related skill loss is 20 percent instead of the benchmark case's 30 percent and the rate of redeployment-related capital loss is 60 percent instead of 72 percent. It can be shown that in this case aggregate output would converge to a level 1.9 percent above its initial level, higher than that of the benchmark case.

Obstacles to Restructuring and Accuracy in Identification

31. **The above simulations illustrate how the size of the potential gain from the most advantageous restructuring**, that is, reallocation of resources from the least-productive firms to more-productive firms. In general, the market plays a key role in reallocating resources to more-productive firms, and the firm-level data indeed supports such role of the market in Japan. The 200 most-productive firms in our sample raised their employment and capital much faster than less-productive firms during the period 2000–2002 (as discussed in Benchmark Case). However, such ideal restructuring driven by markets may be impeded or slowed by various obstacles such as weak financial disclosure and corporate transparency, existence of business groups characterized by cross debt payment guarantees or cross shareholdings, coordination failures among creditors on debt restructuring, and perverse incentives of banks to provide credit to weak firms.[10] Particularly under weak financial disclosure and corporate accounting practices, it may be hard even to accurately identify the lowest-productivity firms let alone to smoothly reallocate resources. As a result, restructuring carried out under such a situation would not generate as much gain as does the ideal restructuring based on accurate identification of the weakest firms.

32. **Inaccurate identification of the least productive firms can substantially lower the gains from restructuring.** The figure illustrates the consequence of a restructuring that is carried out based on inaccurate identification of the least-productive firms. First consider the case where firms whose productivities rank between the least productive 5 percent and 10 percent are mistakenly selected for restructuring (instead of bottom-0-to-5 percent firms in the benchmark case). The figure shows that output gains from restructuring are still large enough to outweigh the cost, but the net gain is lower than in the benchmark case. Now consider the case where the least productive-10 percent-to-15 percent firms are restructured. In this case, the net output gain of restructuring becomes marginal. Finally, if the least productive 20–25 percent firms are liquidated with their capital and labor being reallocated to others (including the least productive-0-to-20 percent firms), restructuring generates output losses both in the short term and medium term. These results suggest that strong financial disclosure and corporate transparency is a prerequisite for successful corporate restructuring. Furthermore, corporate restructuring would generate better outcome when carried out by



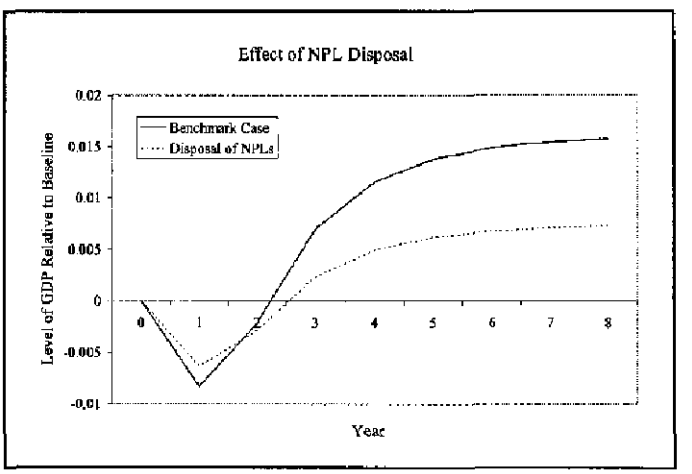
[10] Peek and Rosengren (2003), using Japanese firm-level data for 1993–1999, find that Japanese firms in poor financial conditions are far more likely to receive additional credit from banks, which try to avoid the realization of losses on their own balance sheets.

institutions that have expertise in gathering and processing accurate information on individual firms even under weak financial disclosure by the firms, most probably banks.

Bank-led Restructuring

33. **The impact of corporate restructuring carried out by banks (including through banks' disposal of nonperforming loans) also can be analyzed.** Based on their expertise in distinguishing between the more productive and the less productive among borrower firms, banks may liquidate (or foster the reorganization of) less-productive firms and reduce debt burdens of more-productive firms (for example, through debt-equity swaps). As long as banks perform such a monitoring/allocation function properly, corporate restructuring led by banks can facilitate the reallocation of resources from less-productive firms to more-productive firms and induce a subsequent rise in aggregate output.

34. **The figure illustrates how banks' corporate restructuring through disposal of problems loans can affect the dynamic path of aggregate output.** For this experiment, I assume that bank loans to the firms whose ratio of operating profits to debts are less than 5 percent (on average for 2000–2002) have potential to become bad loans.[11] I also assume that banks have capabilities to accurately measure the productivity of those firms. Further, suppose that among those firms, they liquidate the least productive (representing 5 percent of total corporate liabilities) and reallocate the resources from the closed firms to the other firms.



- In this case, aggregate output declines by 0.6 percent in the first year but converges thereafter to a level 0.7 percent above its initial level. This suggests that corporate restructuring led by banks (including through banks' disposal of NPLs) can generate substantial net output gain. Unsurprisingly, the size of the net gain in this case is lower than the benchmark case where the least-productive among all the firms (including those without bank loans) are restructured.

[11] This assumption is consistent with a study by Atkinson *et al* (2001). They classify potential bad loans into three types depending on the ratio of operating profits to debt: *effectively bankrupt* loans for those with the ratio less than 1 percent, *bankruptcy risk* loans with the ratio more than 1 percent but less than 3.5 percent and *the watch list* loans with more than 3.5 percent but less than 5 percent.

F. Conclusion

35. **This chapter quantitatively assessed both potential benefits and costs of optimal corporate restructuring in Japan over time.** Based on Cobb-Douglas production functions, together with financial statement data of 1,555 Japanese firms and industry-specific labor income share parameters, it calculated total factor productivity of individual firms and derived the distribution of productivity across those firms. Given the productivity distribution and law of motion for the costs of reallocation, the chapter traced the dynamic response of aggregate output to restructuring. While the results in the paper should be viewed only as illustrative, they indicate that well-designed restructuring in Japan could provide a medium-term output gain that substantially outweighs the short-run cost.

36. **The findings of the chapter suggest that corporate restructuring in Japan be pushed forward given that its medium-term output gain substantially outweighs its short-run costs.** Corporate restructuring would be most likely to yield significant gains if accompanied by broader reform measures to achieve the most benefits from restructuring (for example, strengthening of financial disclosure, accounting practices and corporate transparency, and developing of more active M&A markets).

37. **The empirical framework of this chapter suggests some useful avenues for further research on measuring the macro-effect of corporate restructuring in any country including Japan.** While the current framework works nicely to generate plausible estimates of the effect of restructuring in various situations, it might not be the sole empirical approach. Therefore, further studies that adopt different methodology would provide a useful complement to this chapter.

REFERENCES

Atkinson, David, Tonishi Ishida, Hideyuki Ishii, and Katsunori Tanaka, 2001, *Japanese Bank Asset Quality*, Goldman Sachs.

Cabinet Office, 2001, "The Disposal of Non-Performing Loans and Its Potential Influence: Executive Summery," Japanese Cabinet Office.

Chopra, Ajai, Kenneth Kang, Meral Karasulu, Hong Liang, Henry Ma, and Anthony Richards, 2002, "From Crisis to Recovery in Korea: Strategy, Achievements, and Lessons," In: Coe, David, and Se-Jik Kim (Eds.), *Korean Crisis and Recovery*, IMF and KIEP, pp.13–104.

Dell'Ariccia, Giovanni, 2003, "Banks and Credit in Japan," In: Callen, Tim, and Jonathan Ostry (Eds.), *Japan's Lost Decade: Policies for Economic Survival*, IMF, pp. 43–61.

Hamao, Yasushi, Jianping Mei, and Yexiao Xu, 2003, "Idiosyncratic Risk and the Creative Destruction in Japan," NBER Working Paper 9642.

Kamada, Koichiro, and Kazuto Masuda, 2001, "Effects of Measurement Error on the Output Gap in Japan," *Monetary and Economic Studies* (May 2001), Bank of Japan, 109–154.

Khatri, Yougesh, Luc Leruth, and Jenifer Piesse, 2002, "Corporate Performance and Governance in Malaysia," IMF Working Paper WP/02/152.

Kim, Se-Jik, 2002, "Bailout and Conglomeration," *Journal of Financial Economics*, forthcoming.

Kim, Se-Jik, and Ivailo Izvorsky, 2002, "Aggregate Shock, Capital Market Opening, Optimal Bailout, and Structural Reform," *Mimeo*.

Krueger, Anne, and Jungho Yoo, 2002, "Falling Profitability, Higher Borrowing Costs, and Chaebol Finances During the Korean Crisis," In: Coe, David, and Se-Jik Kim (Eds.), *Korean Crisis and Recovery*, IMF and KIEP, pp.157–196.

Mody, Ashoka, 1999, "Asian Restructuring: From Cyclical Recovery to Sustainable Growth," Chapter 3 of *Global Economic Prospects 2000*, The World Bank.

OECD, 2002, *OECD Employment Outlook*, OECD.

Ogawa, Kazuo, 2003, "Financial Distress and Employment: The Japanese Case in the 90s," NBER Working Paper 9646.

Peek, Joe, and Eric Rosengren, 2003, "Unnatural Selection: Perverse Incentives and the Misallocation of Credit in Japan," NBER Working Paper 9643.